ILVR: Conditioning Method for Denoising Diffusion Probabilistic Models

Abstract

Denoising diffusion probabilistic models (DDPM) have shown remarkable performance in unconditional image generation. However, due to the stochasticity of the generative process in DDPM, it is challenging to generate images with the desired semantics. In this work, we propose Iterative Latent Variable Refinement (ILVR), a method to guide the generative process in DDPM to generate high-quality images based on a given reference image. Here, the refinement of the generative process in DDPM enables a single DDPM to sample images from various sets directed by the reference image. The proposed ILVR method generates high-quality images while controlling the generation. The controllability of our method allows adaptation of a single DDPM without any additional learning in various image generation tasks, such as generation from various downsampling factors, multi-domain image translation, paint-to-image, and editing with scribbles.